

A Semantic Web Approach to Feature Modelling and Verification

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Outline

- Feature Modelling
- Feature Modeling using OWL (Semantic Web standard)
- Conclusion and future work



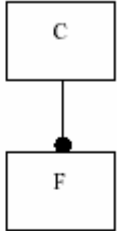
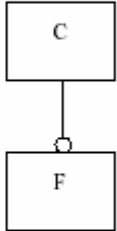
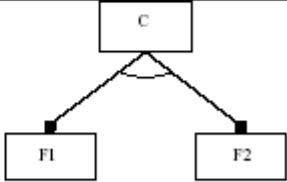
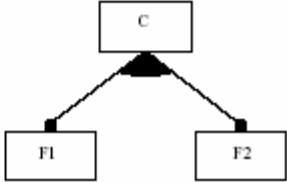
Feature Modelling (I)

- Motivations: reuse
- Feature: a distinguishable characteristic of a concept
- Where are they used?
 - Domain analysis
- Feature models
 - Describing common and different requirements
 - Features discriminate between concept instances
 - Features are relevant to end-users
 - Dependencies among features
- *Practical issue*: automatic analysis of feature models



Feature Modelling (II)

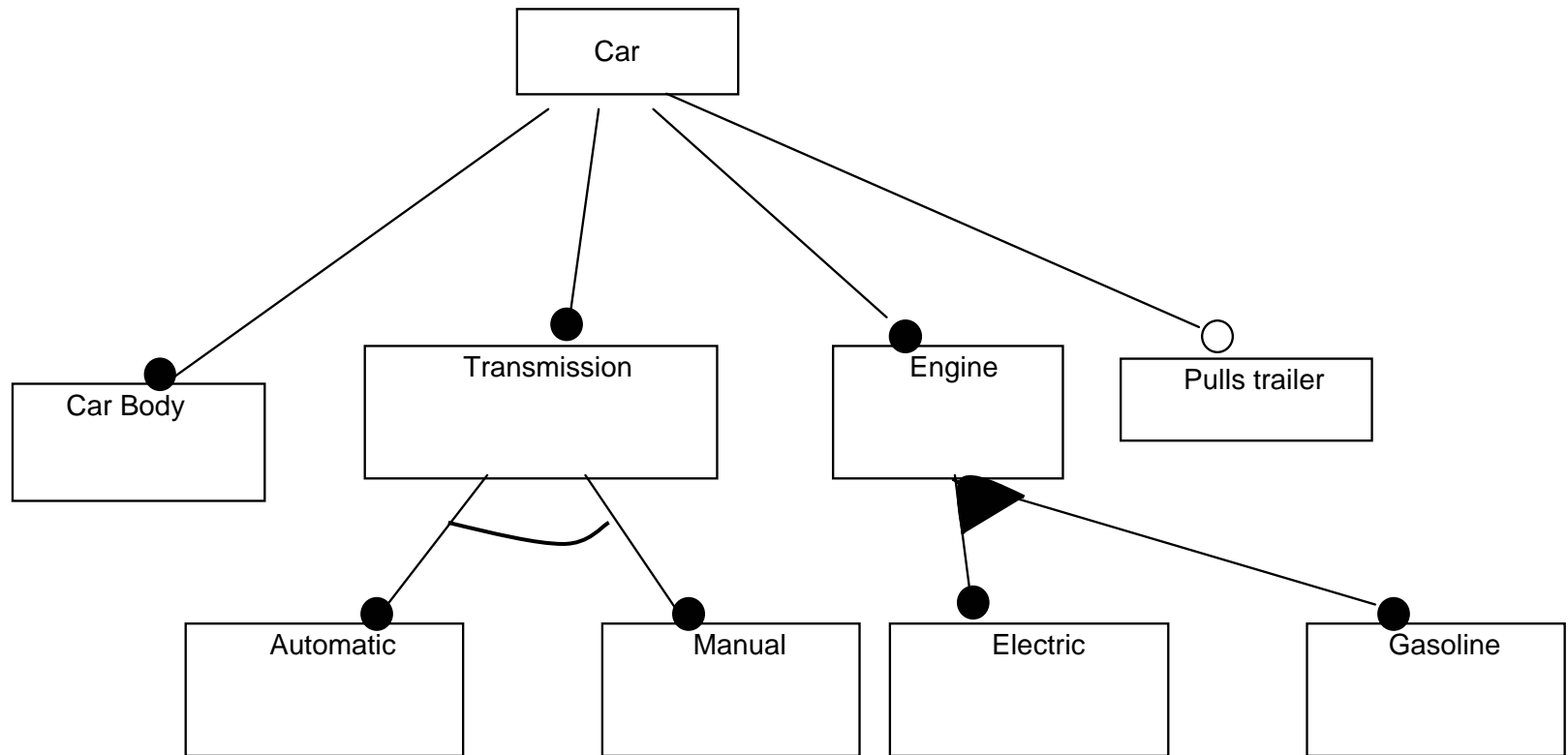
- Feature diagrams
 - Root node: a concept feature
 - Other nodes: sub-features of the system
 - Four types of sub-features
- Feature relations
 - Requires
 - Excludes

Type	Notation
Mandatory	
Optional	
Alternative	
Or	



Example

- A feature diagram of the Car concept



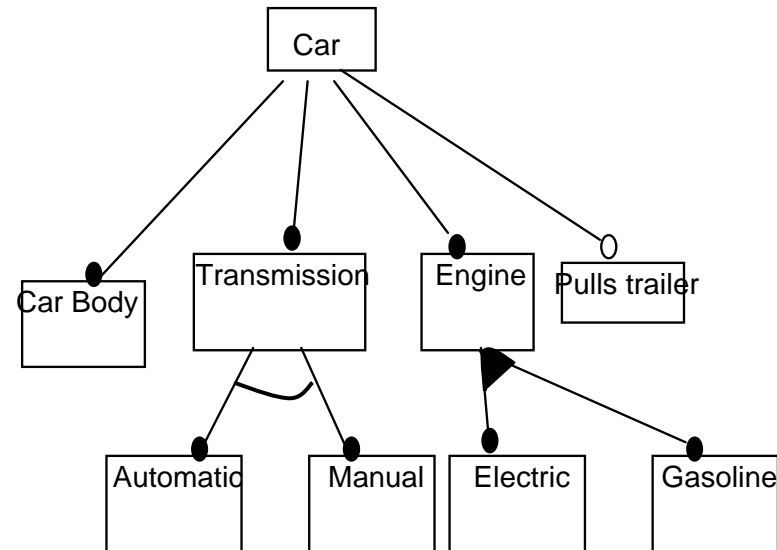
Analyzing and Validating Feature Models

- No mature tool that can check
 - Consistency a feature model
 - Correctness of a feature configuration
- Requirements for the tool
 - Automated inconsistency detection
 - Expressiveness
 - Scalability
 - Debugging
- OWL Lite may be a good candidate



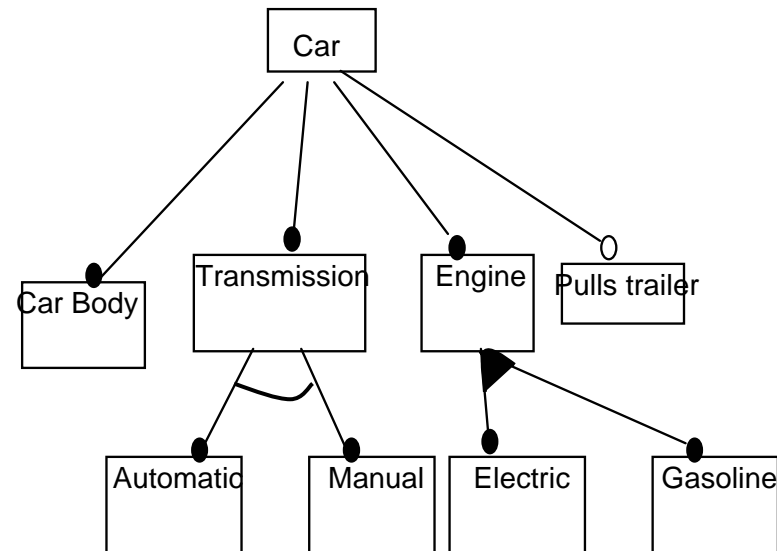
Feature Modelling using OWL

- The parent feature C and the children features F1, ..., Fn are disjoint from each other
- Mandatory: Car v 9hasBody.Body



Feature Modelling using OWL

- The parent feature C and the children features F1, ..., Fn are disjoint from each other
- Optional: PT v 9hasCar.Car



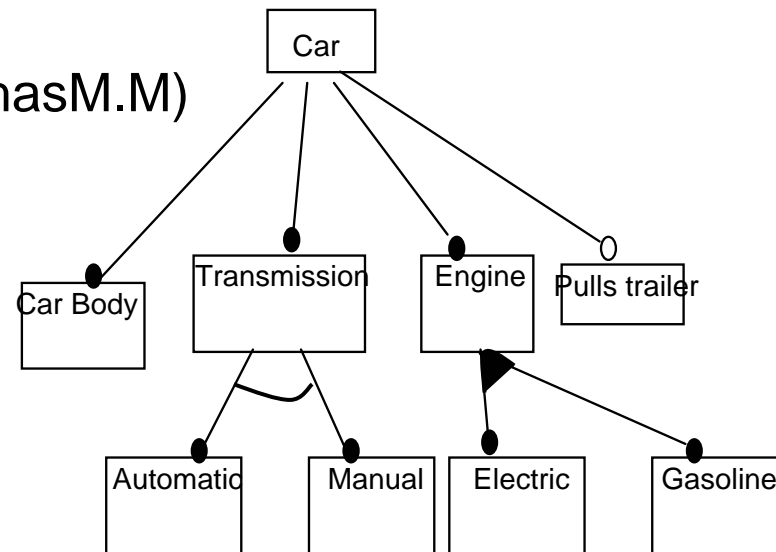
Feature Modelling using OWL

- The parent feature C and the children features F1, ..., Fn are disjoint from each other

- Alternative:

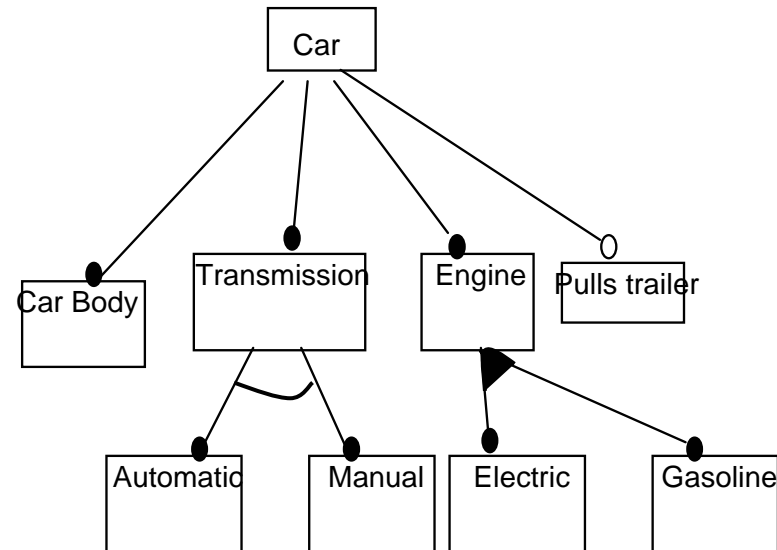
Transmission v 9hasAM.AM t 9hasM.M

Transmission v : (9hasAM.AM u ... u 9hasM.M)



Feature Modelling using OWL

- The parent feature C and the children features F1, ..., Fn are disjoint from each other
- Or: Engine v 9hasElectric. Electric t 9hasGasoline. Gasoline



Feature Modelling using OWL

- The parent feature C and the children features F1, ..., Fn are disjoint from each other

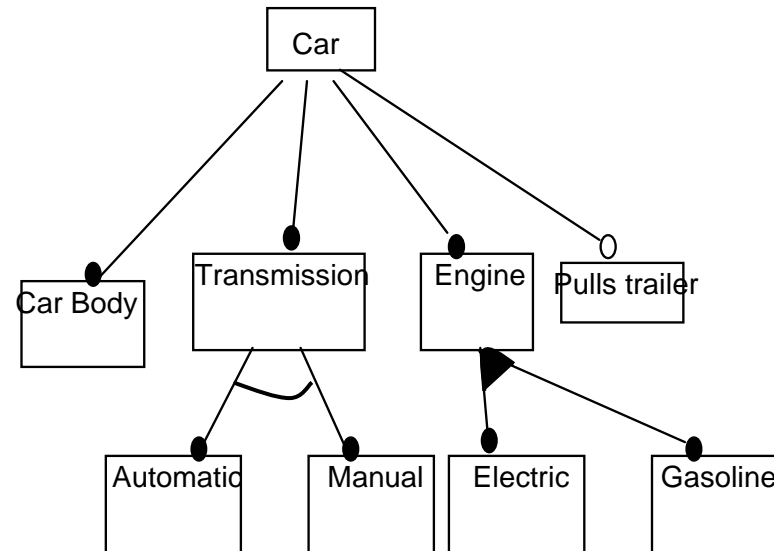
- Requires: $F_i \vee \exists \text{has} F_j.F_j$
- Excludes: $F_i \vee : (\exists \text{has} F_j.F_j)$

- Configuration:

$C1 = \exists \text{hasBody.Body} \cup \exists \text{hasTrans.Trans} \cup$

$\exists \text{hasEngine.Engine} \cup \exists \text{hasAM.AM} \cup \exists \text{hasM.M} \cup$

$\exists \text{hasElectric.Electric} \cup \exists \text{hasPT} \cup \exists \text{hasGasoline}$



Conclusion

- Using an OWL reasoner to provide a validation facility for checking feature models
 - full automated, efficient, scalable
- Challenge for OWL: difficult to debug
 - An OWL debugger has developed (ISWC05)



Take Home Message

- ✓ Semantic techniques can be very helpful for feature modelling.

